# Anatomy of a buzzword: the emergence of 'the water-energy-food nexus' in UK natural resource debates

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Anatomy of a buzzword: the emergence of 'the water-energy-food nexus' in UK natural resource debates

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**Author names and affiliations**

Rose Cairns
SPRU – Science Policy Research Unit, University of Sussex, Brighton BN1 9SL
R.cairns@sussex.ac.uk

Anna Krzywoszynska*
Department of Geography, University of Sheffield, Sheffield S10 2TN

(*Corresponding Author)

**Abstract**

*The existence of a water-energy-food 'nexus' has been gaining significant attention in international natural resource policy debates in recent years. We argue the term 'nexus' can be currently seen as a buzzword: a term whose power derives from a combination of ambiguous meaning and strong normative resonance. We explore the ways in which the nexus terminology is emerging and being mobilised by different stakeholders in natural resource debates in the UK context. We suggest that in the UK the mobilisation of the nexus terminology can best be understood as symptomatic of broader global science-policy trends, including an increasing emphasis on integration as an ideal; an emphasis on technical solutions to environmental problems; achievement of efficiency gains and 'win-wins'; and a preference for technocratic forms of environmental managerialism. We identify and critique an 'integrative imaginary' underpinning much of the UK discourse around the concept of the nexus, and argue that attending to questions of power is a crucial but often underplayed aspect of proposed integration. We argue that while current efforts to institutionalise the language of the nexus as a conceptual framework for research in the UK may provide a welcome opportunity for new forms of transdisciplinary, they may risk turning nexus into a 'matter of fact' where it should remain a 'matter of concern'. In this vein, we indicate the importance of critique to the development of nexus research.*

**Keywords**

*Nexus; interdisciplinarity; transdisciplinarity; integration; buzzwords; silos*

**Highlights (3 – 5 bullet points)**

- The term nexus can be usefully understood as a buzzword: a term which is powerful as it combines ambiguity of meaning and strong normative resonance.
- The meanings of the nexus as used by stakeholders are multiple and heterogeneous, and there is not (yet) a singular 'nexus discourse' currently emerging in the UK context.
- The term nexus is being strategically appropriated into already powerful discourses of a managerial type in natural resource debates.
- Much of the current use of the nexus terminology expresses an 'integrative imaginary': an assumption that integration (of sectors, disciplines, knowledges, stakeholders) is possible and desirable.
- There is need to keep the nexus an open 'matter of concern'. Social sciences have key roles to play in this process.

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## 1. Introduction

In recent years the terminology of the 'water-energy-food nexus' (also sometimes called the water-energy-food-climate nexus, energy-food-environment nexus, or the stress nexus: henceforth 'the nexus') has become increasingly prominent in international science policy and natural resource governance circles (Allouche et al., 2015; Andrews-Speed et al., 2014; Kurian and Ardakanian, 2014; Middleton and Allen, 2014; Scott et al., 2011; Sharmina et al., 2016) and as a framing for academic work from across a range of disciplines (Azapagic, 2015; Biggs, 2015; e.g. De Laurentiis et al., 2016; Lubega, William Naggaga, 2014; Rasul, 2014; Smajgl et al., 2016; Yumkella and Yillia, 2015). The burgeoning use of nexus terminology can be traced back to the World Economic Forum in 2008, where prominent business leaders issued a 'call to action' on the ways in which water is 'linked to economic growth across a nexus of issues' (WEF 2008). The following year John Beddington (then Chief Scientific Advisor to the UK government), raised similar issues when he referred to the 'perfect storm' of interlinked challenges facing humanity (Beddington, 2009), and a number of prominent international institutions (such as the World Bank, the UN World Water Assessment Programme, the European Commission, the OECD and the Global Water Partnership) subsequently produced policy and perspective papers on the nexus (Allouche et al., 2015). According to much of this literature, the solution to the interlinked challenges outlined by Beddington, was 'nexus thinking' (e.g. IGD, 2013) or a 'nexus perspective' (e.g. Bonn2011 Conference, 2011). The UN World Water Development Report 2014 provides an exemplar of the usage of nexus terminology within these international natural resource discourses:

> 'The global community is well aware of food, energy and water challenges, but has so far addressed them in isolation, within sectoral boundaries … If water, energy and food security are to be simultaneously achieved, decision-makers … need to consider broader influences and cross-sectoral impacts. They must strive for innovative policies and integrated institutions … A *nexus approach* to sectoral management, through enhanced dialogue, collaboration and coordination, is needed to ensure that co-benefits and trade-offs are considered and that appropriate safeguards are put in place' (UN World Water Assessment Programme, 2014, p. 61 Emphasis added)

The nexus terminology has also entered the lexicon of high profile international development and conservation organisations such as Practical Action (Stevens and Gallagher, 2015), and WWF (WWF, 2015), as well as multinational corporations such as Shell (Shell, 2012), SABMiller (Wales, 2013), and Cocacola (Koch, 2015). It is also gaining prominence as a framework for research funding with, for example, the European Union's Horizon 2020 programme including specific reference to the nexus and 'integrated approaches to food security, low-carbon energy, sustainable water management and climate change mitigation' (European Commission, 2015).

While mobilisation of the nexus terminology to describe resource interdependencies has been most visible in the international arena (Middleton and Allen, 2014), use of the term has become increasingly apparent within the UK, primarily through research funding mechanisms. Here, since 2012 the nexus has been the focus of a number of research activities, funding calls and cross-research council initiatives (e.g. EPSRC, 2014; ESRC / Newton Fund, 2015; ESRC, 2015, 2014, 2013; NERC, 2012). In light of these discursive shifts, critical reflection on the growing influence of the nexus vocabulary in the UK

context is both timely and important. To this end, this paper examines the ways in which nexus terminology is being mobilised and contested by a range of actors in the UK natural resource debates, and seeks to understand if and why it is gaining traction across a range of stakeholder groups. In so doing, it will explore how this vocabulary articulates (or not) with broader trends and discourses in international environmental and science-policy debates, and reflect upon the risks of treating the nexus as a 'matter of fact'. In conclusions, we call for approaches which would open approach the questions posed by the nexus as 'matters of concern', and suggest pathways for social sciences to engage critically in nexus debates.

## 2. Conceptual framework and methodological approach

The paper follows the interpretivist tradition (Fischer, 2003; Hajer and Fischer, 1999), being concerned with 'how the social world is interpreted, understood, experienced, produced or constituted' (Mason, 2002: 3). Our focus is upon the 'world making' properties of language (Cornwall, 2007), and in examining the kinds of work that particular words do for particular actors. We suggest that currently the term 'nexus' can be helpfully understood as a buzzword (cf. Jensen, 2013; Williams et al., 2014; WWF, 2015), and the analysis presented here is situated within a longstanding tradition of discursive profiling of buzzwords or keywords (Cornwall, 2007; Davis, 2008; Mautner, 2005; Rist, 2013; Standing, 2007; Vincent, 2014; Williams, 1976). The elements most characteristic of buzzwords are 'an absence of real definition, and a strong belief in what the notion is supposed to bring about' (Rist, 2013, p. 486). Indeed, the purchase and power of buzzwords arises precisely as a result of 'their vague and euphemistic qualities, their capacity to embrace a multitude of possible meanings, and their normative resonance' (Cornwall, 2007, p. 472), characteristics which enable them to enlist broad support and become useful in a variety of contexts while maintaining an ambiguity around their meaning. As we illustrate, the term nexus meets both of these criteria: the term is used in fragmentary, multiple and ambiguous ways, and yet there is among those utilising this vocabulary a strong belief in the presumed attainability and ultimate benefits of the benefits a nexus approach.

As Vincent (2014) notes, buzzwords derive their meaning from the cluster of inter-related concepts and terms which become associated with them. These associations progressively come to delineate the boundaries of legitimate use. The ambiguous qualities of buzzwords make them particularly susceptible to processes of 'semantic appropriation' to suit particular agendas (Mautner, 2005, p. 95). Exploring the implications of buzzwords in existing debates is particularly important due to the future-orientation buzzwords express. While rooted in the concerns of the present, buzzwords indicate a desirable future state of affairs (Vincent, 2014), and like metaphors (Lakoff and Johnson, 1980) can influence what is thinkable and thus what is doable. As a result, the 'buzz' around the buzzwords is an area of power struggles over competing narratives: 'nodes around which ideological battles are fought' (Stubbs, 2001, p. 188 cited in Mautner, 2005).

The term nexus is deployed in relation to phenomena occurring at a range of scales, and overall the nexus discourse is global in scope, both in terms of interlocutors and analytical focus. The UK is emerging as an important arena for the operationalisation and institutionalisation of the term as a tool for action, including knowledge production, as indicated by its growing importance in academic research. Our analysis problematises some of the tacit assumptions which we can see being currently assimilated into the term nexus as its network of meaning and intent solidifies in the UK context. We show that the term is being appropriated by dominant discourses of the managerialist type, which we

suggests risks turning the nexus into a 'matter of fact', 'a single discrete self-evident problem susceptible to primarily science-based solutions' (Stirling 2015). Where 'matters of fact' are stabilised and established ways of relating to the world, institutionalised by particular (knowledge) cultures, and largely closed to debates about the conditions which enable their existence, 'matters of concern' are processes rather than objects, are characterised by controversy, and are not stabilised or institutionalised (Latour, 2004). In agreement with Stirling (2015), we argue that the epistemological and political character of nexus challenges necessitates a 'matters of concern' approach, and highlight the importance of social science-led productive critique in developing nexus debates.

The present paper is based on a qualitative analysis of 20 semi-structured interviews with key UK stakeholders from across a range of professional cultures active in debates around food/energy/water interdependencies, including: academics from a range of natural and social science and engineering backgrounds; research funders (EPSRC & ESRC), policy makers and civil servants (Defra and the Environment Agency); and private companies; and a qualitative analysis of a wide range of policy documents, funding calls, and published academic papers referring to the nexus. Approximately half of the interviewees were selected on the basis that they actively had used the language of the nexus either in published academic or non-academic work; had received funding for nexus-themed research; or had talked publicly about the nexus in other fora. The remainder of the interviewees were selected from the policy environment and the private sector due to their involvement in what might be considered 'nexus debates', i.e. debates around food, energy, water and environmental interactions and interventions. To protect the anonymity of the participants, they are referred to by their professional affiliation only in the remainder of the text (condensed into: 'academic'; 'policymaker'; 'private sector'; and 'research funder' categories). Direct quotes from the interviewees are incorporated in the text in italics. Recorded interviews lasted from between 25 minutes to an hour, and were coded thematically in NVivo using a grounded, inductive approach to identify prevailing motifs and themes.

## 3. Diverse understandings of the nexus

We find that within natural resource debates in the UK understandings and usage of the term nexus are plural, fragmented, and ambiguous. Thus in addition to simple descriptive understandings of the nexus as '*the interactions between food energy and water*' (academic), the term was also used to refer to particular (integrated) ways of thinking about these interactions: '*the nexus is about the integrated thinking, about the trade-offs and interplays and interactions, between all the various elements of these interconnected systems*' (research funder). For some the term also signified '*outcome improvement*' (research funder) or optimisation, as in the following description: '*everything is inter-linked and there are pinch points where it's really negative and pinch-points where it's really positive. My understanding of the nexus was trying to find those positive points: so what's the optimum*?' (policymaker).

There is a similar lack of clarity or consensus around the degree to which there is a recognisable '*nexus methodology*' (policymaker), or whether this was something that needed to be developed or *'ground-truthed' in order to* demonstrate if and how '*this does something new and different*' (academic). While some interviewees bemoaned the lack of clarity around the term, others were more confident that the nexus referred to 'a *coherent fairly well defined system',* and compared it favourably to other concepts like sustainability, which were felt to be *'much more woolly'* (research funder). Similarly,

there were diverse views about whether what was required was a reduction of ambiguity, or whether the term nexus was simply a '*flag of convenience around which people can organise themselves*', and that it was unhelpful to '*enshrine, cast in concrete a particular approach and call that the nexus approach*' (academic).

Importantly, the term nexus appears to have something of a paradoxical quality, being simultaneously 'unarguably true' at a simple descriptive level, and yet confusingly unintelligible or meaningless to actors unfamiliar with the discourse. As one interviewee commented: *'I think the nexus is a great idea, and obviously one that no one can argue with…*' (policymaker). This unarguable quality of the term has been observed in literature, where water, energy and food are seen as 'essential ingredients to the functioning of economies and societies; there are indeed multiple linkages between them, despite being managed separately; and these linkages do embody many tensions and trade- offs' (Williams et al., 2014). However, the foregoing interviewee went on to highlight that the practical applications of the term were somewhat confusing, while another interviewee pointed out that it was '*not intuitive from the word nexus*' exactly what it referred to (policymaker). This combination of obviousness and ambiguity is characteristic of buzzwords, and may not be entirely benign: on the one hand their 'luminous obviousness' (Cornwall, 2007) may be a way in which the activities of the individuals and organisations mobilising this terminology are placed beyond question; while simultaneously the use of opaque 'technical sounding' terms to describe common sense linkages may act to shore up the claims to power of a managerial elite, who are able to operate this exclusive and fast-changing vocabulary, making particular issues sound 'intellectual and scientific, beyond the understanding of the lay person, best left to 'experts' (Standing, 2007, p. 517).

Given the diverse meanings associated with the term nexus within our study sample, we cannot refer to a singular 'nexus discourse' in the UK context, and would not wish to reify such a construct. In the following section we comment on the key ways in which the terminology is being mobilised by influential actors in relation to broader existing discourses within natural resource debates, and consider critically what the implications of these linkages might be. We then comment on what these emerging understandings of the term nexus may mean for its institutionalisation, and suggest ways of acting against its premature closure.

**3.1 Population, politics and planetary management**

One strand of discourse within which the nexus terminology is being mobilised frames a nexus approach as the necessary response to the problems of global population growth, resource scarcity and increasing urbanisation. As one policymaker interviewee argued: *'By 2050 the world population is projected to reach 9 billion, and with that 9 billion it is also projected that the world's populations will be increasingly urbanised, increasingly middle class, and will have higher water and energy, food demands as a consequence. And the question then is, are there enough resources on the planet for that many people?'.* This kind of framing echoes with international nexus debates (e.g. Hoff, 2011; World Economic Forum, 2011), but has been critiqued by a number of people for its 'tendency towards a managerial security framing of natural resource governance questions' (Srivastava and Mehta, 2014). The presentation of the issue in these terms can act to obscure the political and economic drivers of unsustainable outcomes in favour of a 'carrying capacity' view of the planet. As Stirling puts it: 'there is an implication that the massive planetary impacts in question are exclusive (even necessary) consequences of inherently shared attributes of 'humanity', instead of far more specific, contingent

(and remediable) social, economic, technological and political orders' (2014, p. 6). In this respect, the nexus language aligns with the concept of 'anthropocene', another increasingly prominent keyword. Both concepts emphasize interconnectedness, and draw attention to the scale of human impacts on planetary ecosystems, and both imply a very prominent, and very particular (managerial) role for 'the global research and engineering community', to 'guide mankind towards global, sustainable, environmental management' (Crutzen, 2006, p. 17). Closely linked to this managerial view are the motifs of 'efficiency' and 'win-win outcomes' frequently associated with the nexus, particularly by the business sector. When mobilised by these actors, a focus on the nexus is framed as representing a business opportunity, such as '*a way of simply reducing costs, because… within the way we manufacture our produce… efficiency in water usage always brings about energy efficiency and vice versa actually, so it's about locking in those opportunities by looking at those two issues … in an integrated way*' (private sector).

The seemingly apolitical nature of a focus on business efficiency and win-wins allows the debates to sidestep more fundamental political economy questions about the role of industrial development in environmental degradation and social inequality. The mobilisation of the nexus vocabulary in this way can be situated within broader discursive trends that have been discussed under labels such as 'ecological modernisation' and 'neoliberal environmentalism'. The former is a widespread set of policy discourses that maintain that 'environmental problems can be solved in accordance with the workings of the main institutional arrangements of society' (Hajer, 1997, p. 3), while the latter, refers to a trend toward marketised 'solutions' to environmental problems (Büscher, 2008; Castree, 2007). Both have been the subject of widespread critique by observers who suggest that these framings exclude more critical or radical analysis of problems and solutions.

### 3.2 The integrative imaginary

A consistent and distinctive characteristic of the diverse definitions and framings of 'the nexus' in the UK is what can be termed an 'integrative imaginary', which calls for the bringing together of diverse fields of knowledge with the aim of obtaining a synthesis which is greater than the sum of its parts (cf. Szerszynski and Galarraga, 2013). This trope is the most prevalent in current understandings of the nexus, both within policy, academic, and industry circles, presenting the nexus as being predominantly about '*integration and interconnectedness… getting across the sense that any movement in one plane has movements in other planes*' (research funder).

This integrative imaginary manifests in various interlinked critiques of policy and regulatory 'silos'. Underpinning these critiques is a clear, although not always explicitly articulated assumption that integration or the breaking down of these silos is a) possible; and b) would automatically lead to improved outcomes. As one interviewee put it: '*by taking a nexus based approach you will have a more integrated outlook on what the threats and the pressures are, and you will make more informed decisions*' (policymaker); or as another put it in reflecting on the drivers for 'nexus thinking': '*I think intuitively it makes sense and we would get better outcomes if we managed to consider all of those factors together* (policymaker). Here again, the notion of efficiency, is understood as key to improved outcomes from greater policy integration. As one interviewee put it, a key '*driver at the moment is money, in that when these things are dealt with separately it can't be the most efficient way of doing things'* (policymaker).

While the particular terminology of the nexus is a fairly recent addition to the science policy lexicon, the concept of integration (of disciplines, sectors, governance mechanisms and so on) as an ideal has a much longer pedigree. The nexus narrative can be seen as the latest in a series of policy narratives based on integrative ideals following on from notions such as Integrated Water Resource Management (IWRM), Integrated Natural Resource Management (INRM) and other integrative policies around water that emerged in the 1980s (Jensen, 2013). Similarly in the context of UK policymaking, debates and discussions around the need for more 'joined-up' government can be traced back several decades (BBC, 1998). However, one interviewee highlighted what they perceived as the impossibility of achieving an integrated 'God's eye' overview, and the possible strategic reasons why such a view might be claimed: *'[A]ll our solutions are inevitably siloed solutions, what I'd say is that the hope that you can get a nexus view, frankly anyone who claims to have that view I would seriously disbelieve. Sometimes people claim these views because they want to be influential. There are competing domains of power and influence of who wants to be listened to, and that goes on all the time as part of the environment we work in'* (policymaker).

In the literature, such (calls to) integration has been critiqued for their politically naïve assumption that harmony and trade-offs between sectors can be achieved through integration and dialogue based on reasoned arguments. Jensen highlights that 'everything is not equal in the nexus' as '[s]ome sectors are economically and politically more important than others' (Jensen, 2013). Others have emphasized the inherently political nature of the transformative changes that are required to improve global provision of food, energy and water, including for example, changes in infrastructures, organisations, markets, governance practice and even cultures more widely, rather than simply greater integration or 'joined-up thinking' (Stirling, 2015).

The integrative imaginary is also evident in calls for greater knowledge integration, in which the nexus is framed as a *'way of bringing together inter-related issues or knowledge communities where there was not sufficient integration'* (academic); or manifest in calls for '*a whole systems perspective… to get that integrated view'* (research funder). In this context, 'the nexus' is understood as a problem that is impossible to grasp, or respond to adequately, from within the partial framings of individual academic disciplines. The corollary of this view is some form of synthesis of disciplines; as one interviewee put it: *'it's a multidisciplinary problem, you need multidisciplinary approaches'* (research funder). Like the associated calls to greater policy integration, calls to multi, inter, and transdisciplinarity are far from novel (c.f. Harris and Lyon, 2014; Andy Stirling, 2014a) but have been referred to as a longstanding 'master steering mechanism in government science policy' (Lowe and Phillipson, 2006, p. 167). Frodeman suggests that these calls are best understood as a reflection of profound societal preoccupations with the role of knowledge in achieving 'the good life.' He writes that interdisciplinarity express a 'dissatisfaction with current modes of knowledge production in society', containing 'a collective unconscious of worries about the changing place of knowledge in society and express[ing] a feeling that the academy has lost its way' (Frodeman, 2012, p. xxxii). The growing interest, particularly among UK research funders, in the nexus as a framework for research can be read as the latest manifestation of these broader, longstanding preoccupations with a perceived need to improve the links between academic research and wider societal problems, and to (re)consider societal implications of research. This trend has been described as on-going cultural transformation away from a 'culture of autonomy of science' towards a 'culture of accountability' of science (Nowotny, 1999, p. 248), and is manifest in a range of interlinked and overlapping debates, including the purported shift from 'Mode-1' to 'Mode-2' science (Nowotny et al., 2002), the

emergence of concepts such as 'socially robust' knowledge and 'post-normal science' (Funtowicz and Ravetz, 1994), and the rise of influential frameworks such as Responsible Research and Innovation (Owen et al., 2013).

The urgency, complexity, and contested nature of contemporary social and environmental problems are often cited as the rationale for calls for greater support for inter- and transdisciplinary research, and indeed much effort has been put into understanding what might be termed 'barriers' to these kinds of research and how these might be overcome (Bauer, 1990; Evans and Randalls, 2008; Evans and Marvin, 2006; Evely et al., 2008; Fox et al., 2006; Lowe and Phillipson, 2009; Morse et al., 2007; Weichselgartner and Kasperson, 2010). However, some have critiqued the concept of scientific 'holism' or 'monism' (R B Norgaard, 1992; Sarewitz, 2010) can underpin these calls. With regard to global environmental change science, Castree et al. criticize the integrative ideals implicit in the presumption 'that people and the biophysical world can best be analysed and modified using similar concepts and protocols (for example, agent-based models)', and question the idea that a 'single, seamless concept of integrated knowledge' focused on complex system, is either possible or desirable (Castree et al., 2014, p. 764). Others have critiqued a supposed Western rationality which 'assumes a single individual… observes environmental and social realities, deduces universal truths, and then manages environmental and social systems to better meet human needs' (Richard B. Norgaard, 1992, p. 103). This, it is argued, is patently unrealistic, given that environmental science and management are *social processes*, collective activities that are inevitably and unavoidably divided among many individuals acting through many social organizations. Furthermore, according to Norgaard, there is no reason to decry the ways in which professional communities are divided along the lines of epistemic communities, indeed he suggests that 'it is very difficult to conceive how societies could be structured to manage our interaction with the environment without divisions occurring along patterns of thinking' (*ibid* p. 104).

**4. Keeping the nexus 'a matter of concern'**

The preceding analysis shows that the term 'nexus' currently operates as a buzzword in UK debates, combining a strong normative resonance with an ambiguity around its meaning. While as a buzzword the nexus remains available for various mobilisations, we have detected a growing dominance of certain uses of the nexus over others, with integrative and managerialist approaches gaining ground. Vincent (2014) suggests that as the networks of meaning which surround buzzwords solidify, they turn into *dispositifs* (often translated as 'apparatuses' into English) and acquire the capacity to discipline thought and action in particular ways. Developed by Foucault (1977) as part of broader analysis of the workings of power, the notion of *dispositifs* ('dispositions') indicates articulation of soft power, heterogenous arrangements of material and discursive elements 'enabling or allowing some things to happen without determining the outcomes (Vincent 2014 p.249). As Agamben (2009) shows, the power of *dispositifs* is exercised through the production of their own subjects, 'docile, yet free, bodies, that assume their identity and their "freedom" as subjects in the very process of their desubjectification' (p. 19-20). The *dispositif* creates new subjects through obliterating – rendering impossible, unthinkable, inarticulable – other interpretations of the self. As Cornwall (2007) and Rist (2007) have shown in the case of 'development', this has very real and serious implications as solidified buzzwords become passwords securing access to influence and funding, obscuring what is actually done under their auspices. They also show that opening such terms up to critical scrutiny once the solidification process has happened can be very difficult.

At present the language of the nexus has yet to develop into a *dispositif* in the UK policy domain. Various civil servant interviewees highlighted that their use of the nexus terminology would be selective at most: '*We'd use the term nexus when someone else talks at a conference or something, but it's not a term we would use day to day'* (policymaker). According to a number of civil servants interviewed, the term was not gaining much traction within policy circles as it was not associated with any particular ministerial priority or legal requirement, and as a result continued to be seen predominantly as an academic concept. The ambiguity around the nexus, and hence its currently limited usefulness as a decision-support tool was seen as preventing it from being further integrated into policy processes.

Within the realm of academic research funding, explicit efforts to institutionalise the term as a framework for research are more apparent. Given the inherent difficulties of inter- and transdisciplinary research, moves to institutionalise the nexus as a framework to provide support to these challenging kinds of research are to be welcomed if these provide 'forums of articulation' (Luhmann 2006, p 370) or 'spaces of encounter' for 'meaningful contact' (Valentine, 2008) between people from differing disciplinary backgrounds, or from within and outside academic to come together, bearing in mind the power dimensions inherent in these engagements as previously outlined. However, there are also some risks to these processes of institutionalisation, not least the risk that the use of the concept becomes dogmatic and hence generative of cynicism. In that case it may result in little novelty, but simply lead to, as one interviewee put it, '*creative re-branding*' of existing research, as academics seek to realign their existing research '*according to whatever's in vogue*' with the funders (academic). Research council interviewees were not unaware of this '*risk of people playing to the funder, whatever they think the funder will like*' (research funder), and of the power, as one put it, of '*putting a bag of gold on the table*, *in terms of a convening mechanism'* (research funder).

As we have highlighted, the combination of 'obviousness' and ambiguity associated with the term nexus allows it to be re-appropriated by existing discourses in natural resource debates, such as those of interdisciplinarity and ecological modernisation. While these discourses have seen much critical debate over the years, the urgency associated with the rise of the language of the nexus risks precluding such critical attention. A premature promotion of the nexus as a research framework may as a result have distorting effects on the kinds of research which are encouraged (c.f. Andy Stirling, 2014b). These kinds of effects have been noted, for example with regard to the 'impact agenda' within the UK's research excellence framework (Martin, 2011). As Parry and Murphy explain, there is a danger that the need to demonstrate impact 'promotes research that simply supports existing policy approaches (and which may even be commissioned by policy sources), given that it is far more likely that this kind of research will be cited in policy documents than work which is critical, challenging or innovative' (Parry and Murphy, 2014, p. 98). With regard to the nexus, similar dynamics are already becoming apparent, manifest for example, in narrow conceptualisations of what a 'successful impact' of a nexus approach might mean, specifically understood as '*re-framing the way decisions get taken…bringing a broader evidence base to bear on decision making in policy and in business'* (research funder). The dominance of the interpretations of the nexus which stress efficiency, 'win-wins', and knowledge integration which we had discussed previously can be seen as further worrying indications of this trend. In some cases, industry uptake of a concept was even seen as a benchmark for that concept's validity by the interviewees: '*the fact that some of the market leaders are doing it now indicates that there is validity in the concept'* (research funder). Another interviewee similarly framed industry uptake as a positive attribute of the nexus concept, saying that it was: *'something that*

*politicians and industry … can recognise and think, yes this is something I can sign up to* (research funder).

This narrowing down of options can be contrasted with the narrative of a need for 'social science leadership', which emerges as a key element in the justification of a nexus approach, particularly within the context of research funding (ESRC 2013). The depiction of the social sciences as an add-on to research projects conceived of by natural or physical scientists, or of social scientists as facilitators of policies or programmes devised by others, has long been a point of contention in discourses around problem driven, interdisciplinary research. As one interviewee from a Research Council put it: *'The classic problem that social science has when it comes to problems which are identified as being technological or engineering-type problems, is that the social scientists are often seen as the people who can solve the problem of how much money is it going to make when we bring it to market? Or how much money is it costing us not to do this thing which we wish to advocate? Or how are we going to get the public to accept it?*'.

Greater involvement from social scientists, and status for their findings/framings was widely portrayed as a positive outcome of the institutionalisation of the nexus as a framing for research. For example as one interviewee put it, '*I guess one of the other strengths of the nexus is that it provides a framework that integrates the science and the social science, and it might create higher status for the social sciences and I think that's important and that's useful'* (academic). However, like notions of impact, notions of leadership may be equally susceptible to the distorting influence of power, and it is therefore prudent to be cautious of how such notions are constructed, and their success gauged. Others have similarly argued that within a growing trend towards increasingly applied or engaged research, there has been insufficient attention paid to 'the roles that social scientists have taken on' (Parry and Murphy, 2014, p. 97). Holmes et al. (n.d. forthcoming) critique what is seen as an exclusive focus on 'solving real world problems' as a motivation for interdisciplinarity, and draw attention to the experiential value and 'spill-over effects' of interdisciplinary work. As Stirling highlights, a key role for social scientists is precisely in revealing and resisting these imprints of power on knowledge (Andy Stirling, 2014b), and hence leadership in this context might better be conceived of in more critical terms, a point we elaborate on below.

**5. Conclusion**

The term nexus is being mobilised in natural resource debates in diverse ways across a range of professional cultures in the UK. While it has not yet achieved significant traction in the UK policy domain, processes of institutionalisation of the nexus as a framework for research are underway, associated with claims that this framing has the potential to facilitate new, more impactful ways of doing transdisciplinary science. However, there is some cause for caution: as currently mobilised in relation to other discourses, there are some problematic tendencies which the discursive profiling of the term has explored. That the term articulates with powerful currents in science policy is not surprising in itself, but this prompts questions about what the appropriate role for social scientists might be in this context, and implies that terms like 'impact' and 'leadership' might more productively be conceived of in critical terms with the aim of countering these powerful tendencies. We have questioned the 'integrative imaginary' underpinning much of the nexus discourse, and argue that attending to questions of power (of sectors, disciplines, forms of legitimate knowledge, stakeholders) is a crucial but often underplayed aspect of integration, and inadequately addressed by many actors

in the nexus debates . In many cases, rather than a consensual account of problems and solutions, the encounter between disciplines will produce conflicting accounts, highlighting dissensus and antagonism. This is an inevitable and necessary part of the process, and should not be stifled by the expectation of production of a consensual account (cf. Rescher, 1993).

Like another contemporary keyword, 'the anthropocene', one might characterise the nexus as a 'troubling concept' (cf. Baskin, 2014, p. 3), both in the sense that it highlights unsustainabilities within the current world system (and hence may have the potential to lead to transformative change), but also in the sense that when associated with an apolitical, managerial framing could be highly problematic for some of the reasons previously outlined. On-going efforts to institutionalise the nexus may provide welcome support for inter- and transdisciplinary collaborations (e.g. Howarth and Monasterolo, 2016) which improve the sustainability of food, energy and water provision, but spaces must be created for work which engages with the concept in a more critical way. Here we follow Latour (2004) and Stirling (2015) in their conceptions of critique as a productive practice, generative of debate and resulting in the broadening of epistemic boundaries through the incorporation of multiple voices, perspectives, and values. This approach is highly appropriate to the character of nexus challenges as spaces where ecological processes and societal needs are brought together, and where issues are not framed purely in relation to categories rooted in natural sciences (such as watersheds), but rather have to be constructed, understood and managed through hybrid (socio-ecological) 'problem-sheds' framings (Muller 2015).

In this context, we suggest social sciences can aid the creation and management of nexus 'problem-sheds' through three critical modes. Firstly, and as illustrated through the work done in this paper, social sciences should interrogate what kinds of realities (modes of knowing and acting in the world) come into being through articulations and enactments of the nexus, and how those realities relate to and affect one another. Secondly, by bringing to the fore the often implicit normative dimensions of these enactments, social sciences can help to foster reflexivity and ensure the actors involved in creating nexus framings remain attentive to their own world-making powers, and to the questions of social and environmental justice (cf. Stirling 2015, Szerszynski and Galarraga 2013b). Thirdly, social science critique can attend to and supports alternative practices of understanding and intervening in 'nexus challenges'. The critic, Latour (2004) argues, should be also the one who assembles, creating an arena in which diverse participants representing a variety of values and perspectives can gather. For us, this indicates a key role for social sciences as creators of 'nexus forums' where the modes of understanding and acting on nexus challenges may be debated, and where power differences between the participants may be recognised and addressed, ensuring social robustness of nexus processes and products. The importance of critique to the future of nexus debates presents a significant opportunity for social science scholars which deserves to be taken seriously, and we hope this paper will contribute to this process.

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